

Occupation, Industry, and Fatal Motor Vehicle Crashes in 20 States, 1986–1987

ABSTRACT

Background: Motor vehicles are a leading cause of injury on and off the job.

Methods: To describe the occurrence of fatal motor vehicle crashes in the working-age population, a case-control study was conducted among persons 15–64 years old who died in 1986 or 1987 in any of 20 states reporting death certificate occupational data to the National Center for Health Statistics. Cases were occupants of motor vehicles (excluding motorcycles) who died of injuries sustained in a crash (E810-E825, 9th revision International Classification of Diseases), and controls died of any other cause.

Results: Transportation-related occupations had more than the expected number of deaths for men (odds ratio = 1.6, 95% confidence interval = 1.4–1.9) and women (odds ratio = 2.1, 95% confidence interval = 1.0–4.5), as did managerial occupations (odds ratio = 1.3 and 1.7, 95% confidence interval = 1.1–1.5 and 1.3–2.2 for men and women, respectively). Men in mining and oil drilling occupations and the wholesale trade industry also had excess crash deaths. Among women, additional excesses were observed among professional specialists and in several groups with few deaths, including agriculture, construction, and the military, whereas homemakers had markedly fewer vehicle crash deaths than expected.

Conclusions: These findings encourage further investigation of this important safety hazard, but also call attention to a need for more detailed studies and improved data. (*Am J Public Health.* 1991;81:733–735)

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Introduction

Motor vehicles cause more fatal occupational injuries in the United States than any other agent.¹ Previous studies providing data on this problem have focused on single states or selected occupational groups,^{2–6} but this investigation, using death certificate data from the National Center for Health Statistics, was undertaken to provide a description of the overall epidemiological pattern of motor vehicle-related fatalities in the United States working population to be used in planning future research and prevention efforts.

Methods

The subjects of this study were residents of 20 states (Alaska, Colorado, Georgia, Indiana, Kansas, Kentucky, Maine, Missouri, Nevada, New Hampshire, New Mexico, North Carolina, Ohio, Oklahoma, Rhode Island, South Carolina, Tennessee, Utah, Vermont, and Wisconsin) who died in 1986 or 1987. Only these states coded occupation and industry data from death certificates and reported them to the National Center for Health Statistics (NCHS) in at least one of those two years. Occupation and industry coding are done by the states according to the 1980 US Census Bureau occupation and industry classification system.⁷

Subjects were selected from 1986 and 1987 mortality data tapes from NCHS. All 5,031 men and 1,776 women 15–64 years old who died of injuries received as drivers or passengers in crashes of motor vehicles other than motorcycles (coded E810-E825 with 4th digit equal to 0 or 1 according to the International Classification of Diseases, 9th Revision), and who had an occupation other than “student,” “volun-

teer,” “never worked,” or “retired” on the death certificate were selected as cases. A control group of 7,167 men and 4,369 women was formed by selecting a 5 percent simple random sample of deaths from all causes other than motor vehicle crashes from the same NCHS tapes using restrictions identical to those applied to the cases.

Standard case-control odds ratios were computed by treating each occupational category in succession as the “exposed” group, and all other categories combined as “unexposed.”⁸ The odds ratios can be interpreted as the ratio of the observed number of motor vehicle crash fatalities in each occupational category to that expected based on the experience of all others.⁹ Age-adjusted odds ratios were estimated by the Mantel-Haenszel method, and test-based confidence intervals were computed for both the crude and adjusted estimates.⁸ Because female homemakers were the largest single occupational group, they were considered separately using all women with employment outside the home as the unexposed referent, but were excluded from all other analyses involving women.

Results

Occupation

Crude and age-adjusted odds ratios for motor vehicle crash fatalities by occupation are shown in Table 1. Without adjustment for age, men in white collar oc-

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TABLE 1—Odds Ratios (95% confidence intervals in parentheses) for 1986–87 Motor Vehicle Crash Deaths for Men and Women Aged 15–64 years by US Census Bureau Occupational Category (unexposed referent group is all other occupations)

Occupation	Men				Women ^a			
	Cases	Controls	Crude	Age-adjusted	Cases	Controls	Crude	Age-adjusted
Professional specialists	243	501	0.7 (0.6, 0.8)	0.9 (0.8, 1.1)	175	310	0.9 (0.8, 1.1)	1.2 (1.0, 1.5)
Technicians & related support workers	99	104	1.4 (1.0, 1.8)	1.1 (0.8, 1.5)	58	74	1.3 (0.9, 1.9)	1.2 (0.8, 1.8)
Sales	403	605	0.9 (0.8, 1.1)	1.2 (1.0, 1.4)	164	246	1.0 (0.8, 1.3)	0.9 (0.7, 1.2)
Administrative support & clerical	158	255	0.9 (0.7, 1.1)	0.9 (0.7, 1.1)	269	503	0.9 (0.7, 1.0)	0.8 (0.6, 0.9)
Services	369	597	0.9 (0.8, 1.0)	0.7 (0.6, 0.8)	314	592	0.9 (0.7, 1.0)	0.8 (0.6, 1.0)
Farming & agriculture occupations	238	391	0.9 (0.7, 1.0)	1.0 (0.8, 1.2)	19	27	1.2 (0.7, 2.1)	1.4 (0.6, 3.0)
Forestry, fishing & hunting occupations	48	54	1.3 (0.9, 1.9)	1.0 (0.7, 1.6)	0	1	0	0
Mechanics & repairers	351	422	1.2 (1.0, 1.4)	1.1 (0.9, 1.4)	6	10	1.0 (0.4, 2.7)	0.5 (0.1, 1.8)
Construction trades	571	701	1.2 (1.1, 1.3)	1.0 (0.9, 1.2)	9	2	7.5 (2.0, 27.6)	5.7 (1.2, 26.7)
Extractive occupations	56	58	1.4 (1.0, 2.0)	1.8 (1.2, 2.8)	1	1	1.7 (0.1, 25.8)	1.0 (0.0, 855.0)
Precision production workers	260	452	0.8 (0.7, 1.0)	1.0 (0.9, 1.3)	27	54	0.8 (0.5, 1.3)	1.0 (0.5, 1.8)
Machine operators & tenders	334	503	0.9 (0.8, 1.1)	0.9 (0.7, 1.0)	125	195	1.1 (0.9, 1.4)	1.1 (0.8, 1.5)
Fabricators, assemblers & hand workers	146	174	1.2 (1.0, 1.5)	1.0 (0.8, 1.4)	26	55	0.8 (0.5, 1.3)	0.7 (0.4, 1.4)
Inspectors, testers, samplers & weighers	30	40	1.1 (0.7, 1.7)	1.4 (0.7, 2.6)	15	27	0.9 (0.5, 1.7)	1.5 (0.8, 2.8)
Transportation & material moving occupations	537	658	1.2 (1.1, 1.3)	1.6 (1.4, 1.9)	19	16	2.0 (1.0, 3.8)	2.1 (1.0, 4.5)
Handlers, cleaners, helpers & laborers	683	826	1.2 (1.1, 1.3)	0.7 (0.6, 0.8)	80	113	1.2 (0.9, 1.6)	1.0 (0.7, 1.4)
Military occupations	142	203	1.0 (0.8, 1.2)	0.9 (0.7, 1.3)	10	2	8.3 (2.3, 29.7)	1.5 (0.2, 13.4)
Homemakers	4	5	1.1 (0.3, 4.2)	0.3 (0.0, 1.5)	316	1460	0.3 (0.2, 0.3)	0.4 (0.4, 0.5)

^aAmong women the referent group for each occupation in the paid workforce is all other such occupations, i.e. homemakers are excluded; for female homemakers, the referent group is all occupations except homemaker.

TABLE 2—Odds Ratios (95% confidence intervals in parentheses) for 1986–87 Motor Vehicle Crash Deaths for Men and Women Aged 15–64 years by US Census Bureau Industry Category (unexposed referent group is all other industries)

Industry	Men				Women ^a			
	Cases	Controls	Crude	Age-adjusted	Cases	Controls	Crude	Age-adjusted
Mining	96	107	1.3 (1.0, 1.7)	1.3 (0.9, 1.9)	1	4	0.4 (0.1, 3.5)	0.1 (0.0, 1.1)
Construction	919	1075	1.3 (1.2, 1.4)	1.0 (0.9, 1.1)	29	16	3.0 (1.7, 5.5)	3.2 (1.4, 7.4)
Manufacturing	1249	1880	0.9 (0.9, 1.0)	1.0 (0.9, 1.1)	303	482	1.1 (0.9, 1.2)	1.1 (0.9, 1.4)
Transportation, communication & utilities	499	705	1.0 (0.9, 1.1)	1.4 (1.2, 1.6)	74	76	1.7 (1.2, 2.3)	2.0 (1.3, 3.0)
Wholesale trade	165	197	1.2 (1.0, 1.5)	1.4 (1.1, 1.8)	24	40	1.0 (0.6, 1.7)	0.8 (0.4, 1.5)
Retail trade	603	685	1.3 (1.2, 1.5)	1.0 (0.8, 1.1)	340	437	1.4 (1.2, 1.6)	0.9 (0.7, 1.1)
Finance, insurance & real estate	107	206	0.7 (0.6, 0.9)	1.0 (0.8, 1.3)	92	128	1.2 (0.9, 1.6)	1.2 (0.8, 1.7)
Business & repair services	320	391	1.2 (1.0, 1.4)	1.0 (0.8, 1.2)	38	55	1.2 (0.8, 1.8)	0.9 (0.5, 1.6)
Personal services	80	149	0.8 (0.6, 1.0)	0.7 (0.5, 0.9)	93	262	0.6 (0.4, 0.7)	0.7 (0.5, 1.0)
Entertainment & recreation services	46	68	1.0 (0.7, 1.4)	0.7 (0.5, 1.2)	14	22	1.1 (0.5, 2.1)	1.1 (0.4, 2.9)
Professional & related services	249	534	0.7 (0.6, 0.8)	0.9 (0.7, 1.0)	338	673	0.8 (0.7, 0.9)	0.9 (0.8, 1.1)
Public administration	180	347	0.7 (0.6, 0.9)	1.0 (0.8, 1.3)	49	138	0.6 (0.4, 0.8)	0.6 (0.4, 1.0)
Military	147	209	1.0 (0.8, 1.2)	1.0 (0.7, 1.3)	9	2	7.5 (2.0, 27.6)	1.3 (0.1, 12.5)

^aExcludes homemakers.

occupations, except for technicians and related workers, tended to have essentially the expected number of crash deaths or somewhat fewer, whereas most blue collar occupations had a small excess of deaths. With age adjustment, “extractive” occupations (miners and oil well drillers), and transportation and material moving occupations had the highest odds ratios, with 1.8 and 1.6 times more deaths than expected, respectively. Executives, administrators, managers, and sales workers had more modest excesses of deaths.

For women employed outside the home, some of the largest excesses of ve-

hicle crash fatalities occurred in occupations with relatively few deaths, notably construction trades, transportation, agriculture, and the military. Odds ratios were also elevated, although to a generally lesser degree, in more populous categories, including managerial occupations, professional specialists, and technicians. Female homemakers had very low crash mortality compared to women with paid employment.

Industry

Odds ratios indicating the association of motor vehicle crash deaths with Census

Bureau industry categories are shown in Table 2. Among men, most industries had essentially the expected number of crash deaths. However, the categories of transportation, communication, and utilities and wholesale trade had 40 percent more deaths than expected when adjusted for age.

Construction, followed by transportation, communication, and utilities, were the industrial categories with the largest excesses of crash fatalities among women employed outside the home, with about three and two times the expected number of cases, respectively. The more modest

excess of deaths among women in the finance, insurance, and real estate category may be more quantitatively important given the larger number of deaths in that group. Public administration and personal services are populous categories with substantially fewer deaths than expected. Crude and adjusted odds ratios tended to be similar except for the military category, for which the odds ratio declined sharply with adjustment for age.

Discussion

This 20-state mortality study describes patterns of motor vehicle crash fatality for men and women by occupation and industry. Such information has not been available before for a geographically diverse population including a wide spectrum of occupations. The vital statistics data used in this study offer several advantages for identifying groups of workers at increased risk: death registration is complete, comparability of data between cases and noncases is assured, and large studies including many states and all occupational groups can be done at minimal cost. On the other hand, studies of this type share generic limitations of design and data quality which have been discussed elsewhere.⁹⁻¹¹

The major interpretational challenge of this study is that the data do not allow injuries which occurred while the decedent was working to be distinguished from those which occurred during other activities. To minimize the proportion of nonworkers in the study, only individuals ages 15 to 64 years with an identifiable occupation indicated on their death certificate were included. However, deaths due to injuries which did not occur at work were also necessarily included, because the states do not report to NCHS the death certificate field that identifies on-the-job injuries.¹⁰ A field coded for the place of injury (for example, industrial place, home, or farm) is available from NCHS public data, but it does not appear to effectively distinguish occupational injuries.¹²

Although it would be helpful to separate injuries which occur on the job from those taking place elsewhere, the ability to do so is not central to all potential uses of these data. The present analysis based on occupational groups also approximates the socioeconomic pattern of motor vehicle crash mortality. In addition, the data are relevant to injury prevention efforts, because some programs directed toward workers, like the Occupational Safety and Health Administration's proposed workplace driver training program,¹³ have the potential to reduce injury risk both on and off the job. Accurate identification of mortality excesses due to on-the-job hazards remains important for more specific interventions, such as equipment modifications, however.

In spite of some disadvantages, the data used in this study appear to be sensitive enough to capture previously-observed excess vehicle crash mortality among transportation workers.^{2,6} This should lend some confidence to the interpretation of the occupational patterns of mortality which emerge from these data. Comparison of the crude and age-adjusted odds ratios may also be useful for interpreting the variation in mortality among different groups of workers: the adjusted odds ratios should most accurately reflect the inherent hazardousness of a job, while the crude measures are also sensitive to the sociodemographic composition of the workforce.

Because of the large number of injuries and deaths due to the use of motor vehicles in work, these hazards should be a priority for injury research and prevention. This study suggests that further investigation of managers and other seemingly low-risk groups, in addition to transportation workers, might be warranted. However, the availability of appropriate data remains an obstacle. Uniform coding of the death certificate indication of injury at work and its inclusion in NCHS public mortality data would improve future surveys based on those data, but studies using more detailed information on individuals and vehicles

used for work are also needed to identify factors which could be modified to prevent motor vehicle injuries to workers. □

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